

Research Report 1230

[Handwritten signature]
Nee

1230

DEVELOPMENT AND EVALUATION OF A SIMPLE JOB PERFORMANCE AID FOR M151A1, A2 TRUCK OPERATORS

ADA 082817

David L. Ryan-Jones

ARI FIELD UNIT, USAREUR



U. S. Army

Research Institute for the Behavioral and Social Sciences

November 1979

Approved for public release; distribution unlimited.

80-1

U. S. ARMY RESEARCH INSTITUTE
FOR THE BEHAVIORAL AND SOCIAL SCIENCES
A Field Operating Agency under the Jurisdiction of the
Deputy Chief of Staff for Personnel

JOSEPH ZEIDNER
Technical Director

FRANKLIN A. HART
Colonel, US Army
Commander

NOTICES

DISTRIBUTION Primary distribution of this report has been made by ARI. Please address correspondence concerning distribution of reports to: U. S. Army Research Institute for the Behavioral and Social Sciences, ATTN: PERI-TP, 5001 Eisenhower Avenue, Alexandria, Virginia 22333.

FINAL DISPOSITION This report may be destroyed when it is no longer needed. Please do not return it to the U. S. Army Research Institute for the Behavioral and Social Sciences.

NOTE The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

Unclassified
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 6 MARI-RP Research Report 1230	2. GOVT ACCESSION NO. 9763744A773	3. RECIPIENT'S CATALOG NUMBER 9763744A773
4. TITLE (and Subtitle) DEVELOPMENT AND EVALUATION OF A SIMPLE JOB PERFORMANCE AID FOR M151A1, A2 TRUCK OPERATORS.		5. TYPE OF REPORT & PERIOD COVERED --
6. AUTHOR(s) 10 David L. Ryan-Jones	6. PERFORMING ORG. REPORT NUMBER --	
7. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Research Institute for the Behavioral and Social Sciences 5001 Eisenhower Avenue, Alexandria, VA 22333	8. CONTRACT OR GRANT NUMBER(s) --	
9. CONTROLLING OFFICE NAME AND ADDRESS 7th Army Training Command US Army, Europe	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 16 2Q763744A773	
11. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) -- 12 39	12. REPORT DATE November 1979	
	13. NUMBER OF PAGES 30	
	14. SECURITY CLASS. (of this report) Unclassified	
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) --		
18. SUPPLEMENTARY NOTES --		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Vehicle maintenance Maintenance training Job performance aiding Performance aids JPA research On-the-job training Technical training		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report describes the development and evaluation of a prototype job performance aid for M151A1, A2 truck operators. The job performance aid was formatted as a checklist and was derived from a consolidation of operator checks describing the standards of maintenance on the vehicle for the operator and his supervisor.		
The job performance aid was evaluated in comparison to the operator's technical manual (TM 9-2320-218-10, August 1978). Twenty (20) soldiers were		

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 68 IS OBSOLETE

Unclassified

1 SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

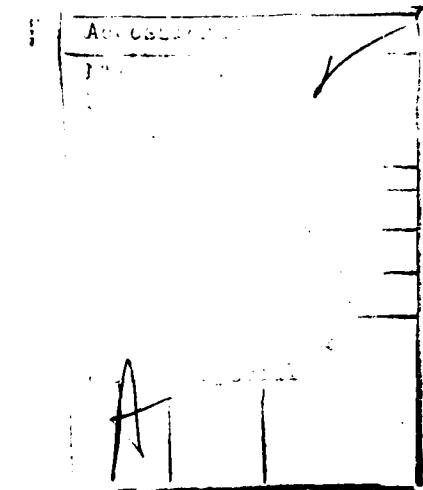
408 010

TP

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

randomly assigned to the job performance aid condition or the technical manual condition, and to one (1) of two (2) vehicles. Each soldier inspected a vehicle using the performance aid or the technical manual, and performance was assessed in terms of the percent of faults found by the soldier in relation to the actual number of faults on the vehicle. Using the job performance aid resulted in better performance than using the technical manual in terms of the percent of faults found (29.8% vs. 10.2%).



Unclassified

ii SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

Research Report 1230

DEVELOPMENT AND EVALUATION OF A SIMPLE JOB PERFORMANCE AID FOR M151A1, A2, TRUCK OPERATORS

David L. Ryan-Jones

John F. Hayes, Team Chief

**Submitted by:
William W. Haythorn, Chief
ARI FIELD UNIT, USAREUR**

Approved by:

**Milton S. Katz, Acting Director
ORGANIZATIONS AND SYSTEMS
RESEARCH LABORATORY**

**U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES
5001 Eisenhower Avenue, Alexandria, Virginia 22333**

**Office, Deputy Chief of Staff for Personnel
Department of the Army**

November 1979

**Army Project Number
2Q763744A773**

Training

Approved for public release; distribution unlimited.

ARI Research Reports and Technical Reports are intended for sponsors of R&D tasks and for other research and military agencies. Any findings ready for implementation at the time of publication are presented in the last part of the Brief. Upon completion of a major phase of the task, formal recommendations for official action normally are conveyed to appropriate military agencies by briefing or Disposition Form.

FOREWORD

The Army Research Institute for the Behavioral and Social Sciences (ARI) maintains a field unit with the U.S. Army, Europe (USAREUR) to conduct research to meet the special needs of USAREUR and to evaluate other research projects and products under front-line operational readiness requirements, with feedback leading to modification and refinements.

Sustainment of maintenance performance is an integral part of any battalion training management system. Sustained maintenance performance is dependent upon the equipment operator and supervisor having clearly defined standards of maintenance. Maintenance standards essentially define the job requirement for the operator and provide the supervisor with useful criteria for inspecting and evaluating the operator.

This report describes the development and evaluation of a prototype job performance aid which defines the standards of operator maintenance for the operator and supervisor of the M151A1,A2 truck. The research was conducted under Army Project 2Q763744A773, "Combat Unit Training".



JOSEPH ZEIDNER
Technical Director

DEVELOPMENT AND EVALUATION OF A SIMPLE JOB PERFORMANCE AID FOR M151A1,
A2 TRUCK OPERATORS

BRIEF

Requirement:

To develop a method for improving operator maintenance performance using the available sources of maintenance information.

Procedure:

A prototype job performance aid in a checklist format was developed using the various technical manuals relating to the M151A1, A2 truck and its various components. The checklist was evaluated by comparing the performance of two groups, one using the job performance aid and the other group using the operator's technical manual (TM 9-2320-218-10, August 1978), in terms of the percent of maintenance faults found on one M151A1 truck and one M151A2 truck.

Results:

The group using the job performance aid found significantly more faults than the group using the technical manual (29.8% vs. 10.2%). Additionally, there was no significant difference in the percent of faults found on the M151A1 compared with the M151A2. The conclusion was that using the job performance aid resulted in better maintenance performance than using the technical manual.

Utilization of Findings:

The findings suggest that consolidation of operator maintenance checks into a comprehensive checklist may result in improved operator maintenance. The results will serve as a guide for the development of simple job performance aids for other equipment in the US Army inventory.

DEVELOPMENT AND EVALUATION OF A SIMPLE JOB PERFORMANCE AID FOR M151A1,
A2 TRUCK OPERATORS

CONTENTS

	Page
INTRODUCTION	1
PROBLEM	1
DEVELOPMENT OF AN OPERATOR JOB PERFORMANCE AID (JPA)	2
TRYOUT OF THE JPA	3
EVALUATION OF THE JPA	4
METHOD	4
RESULTS	5
DISCUSSION	9
REFERENCES	11
APPENDIXES	
A. Operator's inspection guide for the M151A1, A2	12
B. List of faults found on each vehicle by each soldier	25

LIST OF TABLES

Table 1. Soldier number, vehicle number, % faults found, and months of operator experience for each condition	6
2. Mean percent of faults found for all groups	7
3. Summary table for the analysis of variance of the TM group vs. the JPA group (% faults found)	7
4. Summary table for the analysis of variance of the vehicle 1 group vs. the vehicle 2 group (% faults found) ..	7
5. Summary table for the analysis of variance of the TM group vs. the JPA group (months of operator experience) ..	8
6. Summary table for the analysis of variance of the vehicle 1 JPA group vs. the vehicle 2 JPA group (% faults found) ..	8

DEVELOPMENT AND EVALUATION OF A SIMPLE JOB PERFORMANCE AID
FOR M151A1, A2 TRUCK OPERATORS

INTRODUCTION

Organizational maintenance is given a high priority by field commanders who are aware of the importance of well-maintained tactical vehicles and equipment in the combat environment. This priority, however, has not solved the reported maintenance problems in the field. These reported problems include poorly maintained equipment, problems in getting repairs completed, and low morale and interest among operators and mechanics. Maintenance performance is linked to many factors including training, logistics, personnel administration, supervision, leadership, morale, motivation, and a myriad of others. The solution of maintenance problems is dependent upon identifying the factors causing the problems, and developing methods of correcting or reducing these problems.

The importance of working with maintenance problems is not realized until one considers that maintenance costs within DOD account for over 20% of the yearly defense budget. The true cost of maintenance cannot be estimated because the expenditures actually occur in such areas as manpower, supply, transportation, and others (Turke, 1977). Equipment readiness remains as a priority mission regardless of actual cost, but efforts to improve the effectiveness of organizational maintenance may result in better utilization of current resources.

PROBLEM

Organizational maintenance consists of the maintenance tasks of equipment operators and mechanics within the organization, as well as the supply [Prescribed Load List (PLL)] and record-keeping [The Army Maintenance Management System (TAMMS)] functions associated with maintenance activities. First echelon maintenance is the operator portion of organizational maintenance, and second echelon maintenance is the responsibility of the mechanic. Although maintenance problems can occur at any echelon, the equipment operator is usually singled-out as the source of most maintenance problems by both supervisors and mechanics.

Operator maintenance tasks consist almost entirely of identifying equipment maintenance faults, conducting simple preventive maintenance, recording maintenance faults and preventive maintenance, and reporting any faults to supervisors and/or mechanics. Maintenance faults may be specific, such as a cracked windshield, or nonspecific, such as hearing an unusual noise when the equipment is operated. Those faults that the

operator can correct are not recorded or reported except in the case of adding fuel or oil. Faults which the operator cannot correct are recorded on a DA 2404, and this form is given to a supervisor or mechanic. In general, mechanics do not perform any repairs until all operator maintenance is completed.

Specialized training is needed by the operator and supervisor. The maintenance guide for the operator, the -10 Technical Manual (TM), does not cover all there is to know about operator maintenance. The -10TM may also describe the maintenance in an indirect manner, requiring the operator to synthesize the prescribed maintenance from vague or incomplete information. The complexity of operator maintenance may necessitate the development of performance aids to assist the operator and supervisor in performing their assigned functions.

Published standards for operator maintenance do not exist and such standards need to be established so that there is some common ground on which to define good maintenance management practices. There is no indication that operators can perform perfectly on their maintenance tasks, or that all maintenance tasks are critical to vehicle operation. Descriptions of operator maintenance tasks must be related to descriptions to task criticality, inspection frequency, corrective procedures, and standards of performance.

DEVELOPMENT OF AN OPERATOR JOB PERFORMANCE AID (JPA)

The problems of equipment maintenance, as previously mentioned, seem to center around the operator. There are numerous ways to improve operator performance including increased and improved training and documentation, but there are few things which are relatively simple to do. The common reason given for poor operator maintenance is that the operators do not know what to do. Operationally this means that the operators do not have adequate training or experience, or they cannot recall what to do after having received training. Training and experience are beyond the scope of this effort, but an aid to support the operator in recalling the operator checks and services is well within the range of possibilities for improving job performance. A job performance aid can be defined as any device which has the capability of storing information about the job for future use (Joyce, 1975). Since the operator cannot seem to remember which checks to make, the obvious starting point for a job performance aid is a checklist of the required operator checks arranged in some logical manner.

The M151A1, A2 1/4-ton truck was selected as the tactical vehicle to be used in this evaluation. This was because this vehicle has a high density, is mechanically less complicated than most vehicles in

the inventory, and there were numerous reports from the field concerning poor vehicle operator maintenance performance on this vehicle. The M151A1 and M151A2 have some minor differences, but since one or both of the vehicles may be present in a unit, both types of vehicles were included on the same JPA. Also, a 1/4-ton trailer is normally issued with the M151A1, A2 truck and is inspected as if it is part of the M151A1, A2.

The JPA was developed with several things in mind. The JPA had to list all checks the operator was expected to make, when the checks were to be made, the general disposition of any fault found, and where the fault was to be recorded. The JPA had to be pocket sized, inexpensive to reproduce, and was not intended to describe to the operator how to perform the check. Also, the JPA had to be organized in a manner which would allow the operator to conduct a walk-around inspection of the vehicle.

The sources of data concerning maintenance tasks on the M151A1, A2 were varied. The primary sources of information consisted of the various technical manuals relating to the vehicle as well as to smaller components of the vehicle. The basic technical manual, the operator or -10TM, was difficult to use as a data source because maintenance was described in a casual and roundabout manner. Many of the maintenance tasks the operator is expected to know and perform were simply not discussed in the technical manual. The TM's for components on the vehicles, such as batteries and tires, were generally much better and more complete in their listing of operator maintenance tasks. This diversity suggests that an operator would need to have all of these technical manuals available when performing routine operator maintenance.

The real problem in identifying all of the possible operator maintenance tasks is that the tasks are defined in terms of the maintenance echelon responsible for repairing a fault, not in terms of the echelon responsible for identifying that a fault exists. Therefore, a certain amount of judgement had to be exercised in listing the operator maintenance tasks.

TRYOUT OF THE JPA

After listing all of the maintenance tasks, the list was tried-out on two vehicle operators with a battalion-level mechanic accompanying the operators during the maintenance check. Approximately 20% of the maintenance tasks that had to be performed by the operators were not listed in any TM. Additionally, there were modifications and production changes to the vehicles which invalidate, modified, or added maintenance tasks to the list. The operator tryout of the basic list of maintenance tasks took about two hours to complete, which was four times the estimated completion time.

A decision was made to organize the maintenance tasks in a checklist format which was ordered according to where the component to be checked was located on the truck. The checks on the JPA were worded in a positive manner. That is, a check might read "hose secure, not cracked," as opposed to the negative version "hose loose, cracked". The checks were worded in a positive manner in order to stimulate a positive attitude about vehicle maintenance. The JPA was printed in a 5" x 8" booklet form for evaluation. The JPA is shown in Appendix A.

EVALUATION OF THE JPA

The JPA was constructed to represent the maintenance standards of the M151A1, A2 for the operators of the truck. The list of checks was a compilation of maintenance information from a wide variety of official sources. The JPA was considered to be a statement of everything the operator is expected to do in terms of maintenance on the truck. The best way to evaluate a product, such as the JPA, is to compare actual maintenance performance using the product with the method operators currently use for conducting maintenance. Currently, the operators manual, the -10TM, is used as a guide to operator checks and services. The problems of the -10TM have been previously discussed.

METHOD

Twenty (20) soldiers, assigned as vehicle operators, were randomly selected as subjects for the evaluation of the JPA. The soldiers had experience as operators ranging from two (2) to thirty-one (31) months. The soldiers were from the same mechanized infantry battalion, but were from the various companies within the battalion. The soldiers were in Military Occupational Specialties (MOSS) 11B, 11C, 16P, and 17K, and in pay grades E2-E4.

The equipment consisted of two (2) trucks, one (1) an M151A1 and the other an M151A2. The two trucks were considered to be representative of trucks in general in the battalion in terms of the state of maintenance. The trucks were placed end to end over a grease pit to facilitate easy inspection during the evaluation. Each truck was thoroughly inspected by a wheeled-vehicle mechanic so that all vehicle faults could be identified. Since the prototype JPA listed every check an operator must make, the mechanics used the JPA as a guide in inspecting the experimental vehicles. All faults found by the mechanics were recorded on DA 2404s.

Each truck was inspected by one (1) soldier at a time. Each set of two (2) soldiers, one (1) on each vehicle, were allowed one (1) hour in which to inspect the vehicle, with one (1) soldier using the JPA and the other soldier using the technical manual (TM 9-2320-10, August 1978). The conditions were reversed on every other trial so that five (5) soldiers used the JPA and five (5) soldiers used the -10TM to inspect each of the two (2) vehicles. The soldiers were randomly assigned to a vehicle and an inspection trial period. In all there were ten (10) trial periods, with each period lasting one (1) hour. The soldiers were instructed to record any faults found on DA 2404, and were allowed to ask a mechanic for help if they did not know the location of a component on the truck or how to check the component.

RESULTS

The number of maintenance faults found by the operators was converted to % faults found in relation to the number of faults identified by the mechanic in inspecting each vehicle. These data, along with the soldier number, vehicle number, and months of experience as an operator, are shown in TABLE 1, for both the technical manual and job performance aid conditions. The actual number of faults identified on Vehicle 1 by the mechanic was fifty-one (51), and sixty-three (63) faults were identified on Vehicle 2 by the mechanic inspecting that truck. The number of months of operator experience was obtained from the soldiers before the experiment began. The faults found on each vehicle by the soldiers in each group are listed in APPENDIX B. This information was extracted from the DA 2404s the soldiers completed during the experiments.

The number of months of experience as an operator was derived from the total US Army vehicle operator experience for each soldier, and not for just the M151A1,A2 experience. This was done because many of the operator maintenance tasks are the same or are similar on a wide variety of vehicles. There is no way to assess transfer of training between vehicles on these tasks. Additionally, operators are usually qualified to operate several types of vehicles, and frequently do so during a relatively short period. Civilian operator experience was not included since there was no way to assess the degree to which operator maintenance was conducted, and because operator maintenance tasks are not as well defined in the civilian context as in the military context.

TABLE 1

Soldier Number, Vehicle Number, % Faults Found, and
Months of Operator Experience for Each Condition

<u>TECHNICAL MANUAL</u>				<u>JOB PERFORMANCE AID</u>			
Soldier	Vehicle	% Faults Found	Months of Experience	Soldier	Vehicle	% Faults Found	Months of Experience
1	1	8	7	11	1	22	13
2	1	10	6	12	1	37	3
3	1	8	4	13	1	43	24
4	1	8	21	14	1	31	11
5	1	10	18	15	1	43	17
6	2	8	5	16	2	10	12
7	2	16	6	17	2	24	13
8	2	8	5	18	2	48	18
9	2	5	7	19	2	27	2
10	2	21	31	20	2	13	12

The mean percent of faults found for all soldiers for Vehicle 1 and Vehicle 2, and for the technical manual and job performance aid groups were calculated and are displayed in TABLE 2.

TABLE 2
Mean Percent of Faults Found for all Groups

	VEHICLE 1	VEHICLE 2	TOTAL
TM	8.8	11.6	10.2
JPA	35.2	24.4	29.8
TOTAL	22	18	

The performance of the soldiers in the TM and JPA treatment groups were compared by analysis of variance. The JPA group had significantly better performance than the TM group with $F = 20.21$, $df = 1, 18$, and $p < .001$, as shown in TABLE 3.

TABLE 3
Summary Table for the Analysis of Variance of the
TM Group vs. the JPA Group (% Faults Found)

SOURCE	SS	df	MS	F	p
TOTAL	3632	—	—	—	—
Between groups	1920.8	1	1920.8	20.21	< .001
Within groups	1711.2	18	95.06	—	—

The performance of the soldiers in the Vehicle 1 group was compared with the performance of the soldiers in the Vehicle 2 group by analysis of variance, and is shown in TABLE 4. There was a nonsignificant difference between groups with $F = .41$, $df = 1, 18$, and $p > .10$.

TABLE 4
Summary Table for the Analysis of Variance
of the Vehicle 1 Group vs. the Vehicle 2 Group (% Faults Found)

SOURCE	SS	df	MS	F	p
TOTAL	3632	—	—	—	—
Between groups	80	1	80	.41	> .10
Within groups	3552	18	197.3	—	—

The number of months of operator experience was compared between the TM group and the JPA group using analysis of variance. The results are shown in TABLE 5, and are nonsignificant with $F = .178$, $df = 1, 18$, and $p > .10$.

TABLE 5

Summary Table for the Analysis of Variance
of the TM Group vs. the JPA Group (Months of Operator Experience)

SOURCE	SS	df	MS	F	p
TOTAL	1149.75	—	—	—	—
Between groups	11.25	1	11.25	.178	> .10
Within groups	1138.5	18	63.25	—	—

The performance, in terms of percent faults found, of the soldiers using the JPA was compared as a function of the type of vehicle inspected. The results are shown in TABLE 6 and were nonsignificant with $F = 1.91$, $df = 1, 8$, and $p > .10$.

TABLE 6

Summary Table for the Analysis of Variance
of the Vehicle 1 JPA Group vs. the Vehicle 2 JPA Group (% Faults Found)

SOURCE	SS	df	MS	F	p
TOTAL	1509.6	—	—	—	—
Between groups	291.6	1	291.6	1.91	> .10
Within groups	1218	8	152.3	—	—

The months of operator experience was correlated with the % faults found for the TM group using the Pearson method with $r = +.606$, $df = 8$, and $p < .10$. Likewise, the months of operator experience was correlated with the % faults found for the JPA group using the same method with $r = +.369$, $df = 8$, $p > .10$.

DISCUSSION

The results strongly indicate that the JPA produced better performance, in terms of finding vehicle faults, than the TM ($F = 20.21$, $df = 1, 18$, $p < .001$). The absolute performance of the JPA group was about three times better than the TM group in terms of percent of faults found (29.8% vs. 10.2%). This difference is really a measure of the effect of level of detail upon performance. The -10TM checklist may be considered to be a checklist which is more simple than the JPA in the level of detail concerning the checks to be made. The -10TM describes the categories of checks to be made on the truck, but does not specifically describe what kinds of problems can arise with a component as does the JPA. The JPA is still simple, in terms of all JPAs, in that the JPA is not fully proceduralized with graphics, does not describe inspection frequency of individual components, and does not discuss disposition of a fault in detail once the fault is found (Booher, 1978).

There was some concern that experience was the major factor in vehicle maintenance performance, and that one condition might appear to be better than the other due to differences in the mean group experience level. There was actually no significant difference in mean group experience ($F = .178$, $df = 1, 18$, $p > .10$). The interesting finding was that months of operator experience correlated highly with performance in the TM group ($r = +.606$, $df = 8$, $p < .10$) but operator experience did not correlate highly in the JPA group ($r = +.369$, $df = 8$, $p > .10$). This may indicate that the -10TM checklist is just too basic and does not provide the operator with enough information to conduct the prescribed maintenance checks, forcing the operator to rely on his/her experience as the source of maintenance information.

Since the M151A1 and M151A2 are somewhat different, although the differences were not considered to be major, there may have been some difference in overall performance of the soldiers due to these differences and some bias in the JPA which favored one truck over the other. The results indicate that there was no significant difference between the two trucks for soldier performance in terms of the percent of faults found ($F = .41$, $df = 1, 18$, $p > .10$). Additionally, there was no significant difference in the performance of the soldiers using the JPA as a function of the type vehicle inspected ($F = 1.91$, $df = 1, 8$, $p > .10$). This implies that the JPA may be used with either truck without penalty, or advantage, in terms of finding vehicle faults.

There was some disappointment with the absolute performance of the JPA group (29.8% faults found). The expected performance level of the JPA group was that nearly all faults would be found. However, there was no control over the motivation level and level of supervision of the soldiers. At the same time, there is no reason to believe that a motivated or well-supervised soldier would perform any better using the JPA. There might be improved performance if the JPA were combined with information describing the location of a component and the procedure to check the component. This may not be necessary if soldiers were to receive instruction on the components and inspection procedures before receiving the JPA as an operational checklist.

The real utility of this kind of JPA is that the standards of operator maintenance are available to both the operator and supervisor.

REFERENCES

Booher, H. Job Performance Aids: Research and Technology State-of-the-Art (NPRDC-TR-78-26). San Diego, CA: Naval Personnel Research and Development Center, July 1978. (AD A057 562).

Joyce, R. Performance Aids and Technical Training: Complementary Information. New Concepts in Maintenance Trainers and Performance Aids (TR-IH-255). Orlando, FL: Naval Training Equipment Center, October 1975.

Turke, J. It Isn't the Cost; It's the Upkeep. Defense Management Journal, 1977, 13, 2-9.

APPENDIX A
OPERATOR'S INSPECTION GUIDE FOR THE M151A1, A2

The inspection guide which follows was prepared by extracting operator checks from the various technical manuals relating to the vehicle and vehicle components. Additionally, the checks extracted from the technical manuals were reviewed by wheeled-vehicle mechanics to insure accuracy and completeness. The inspection guide was then tried-out on several operators to insure that the average operator could understand and work with the checklist. The draft inspection guide was then copied onto 8" x 10" paper and folded into a 5" x 8" booklet form. The booklet form was used during the evaluation discussed in the main report.

This is a checklist for weekly inspection of the M151A1 or A2. It covers all the items a battalion inspection would cover.

As you go through the checklist, enter each problem or deficiency on the form 2404 right away. Enter all of them, even the problems you can fix yourself (like adding oil) and the problems that may already be written up on the 2408-14 (like a part that is on order).

You don't need to write anything on this checklist. You should use it over again each week until it is too dirty or too worn to use, then get a replacement copy.

OPERATOR'S INSPECTION GUIDE

FOR M151A1 and A2

BEFORE YOU START, GET A RAG, A SCREWDRIVER,
A RULER, AND FORM 2404.

FILL IN TOP OF FORM 2404

1. CHECK THE FRONT OF THE TRUCK.

Slave receptacle

- cap secure, serviceable
- receptacle not excessively burned

Windshield

- hinges secure and not rusty
- hood cushion bumpers (2) present
- hood safety catch not broken or bent

Hood

- hold-down catches and springs secure and serviceable
- safety catch not broken or bent
- hood not damaged or rusty
- hood does not squeak when opened
- antifreeze, serial number, and safety stencils readable
- grille bumpers (6) present
- hinges secure (3 nuts and bolts each)

Bumpers

- numbers are correct and clearly readable
- bumper is not rusty or damaged
- fastenings are secure

Lift shackles

- secure, not stuck or damaged
- pin/chain present and serviceable
- side channel secure, not crushed

Grille

- not bent or rusty
- seams not cracked
- side channel secure, not crushed

Lights

- mounted securely
- glass not cracked or painted over
- no moisture in lights
- no bare wires or cracked insulation (wires under hood are checked later)
- all bolts/screws present
- markers/turn signals aligned

Fenders

- not damaged or rusty
- seams not cracked

Cowl vent (if truck has one)

- present and not rusty, stuck or clogged
- hinge secure and serviceable

2. CHECK UNDER THE HOOD--PART 1

Radiator

- not leaking, clogged or rusty
- mounted securely
- cap present, properly seated, not damaged or rusty
- chain present, secure, not rusty
- overflow line serviceable
- coolant level above metal in radiator
- antifreeze

Water hoses (2)

- no leaks
- hoses not cut or spongy
- clamps tight and serviceable (check with screwdriver)

Intake manifold

- secure, not cracked or leaking
- gasket present, not leaking
- lock tabs on lower bolts (2) present

Exhaust manifold

- no leaks (discolored)
- secure, with lock tabs serviceable
- not rusted through
- pipe flange gasket present and serviceable

Master cylinder

- brass seal present
- vent hole in plug not clogged
- fluid level to top of neck
- plug finger tight

Air cleaner

- screen not damaged
- gaskets/joints seal tightly
- oil not gritty or low
- hoses (4) serviceable, clamps secure

Generator/alternator

- pulley not loose, cracked, or bent
- belts tight (1 1/2" deflection with 2 fingers)
- pulleys not loose, bent, or cracked
- mounting bolts present and secure
- adjustment arm not loose, serviceable
- wires secure, insulation not cracked
- cables secure, not damaged
- warning cover present, screws (2) secure

Carburetor

- secure, no leaks
- couplings and joints not bent, crushed, or binding
- retainers/pins present and not bent
- throttle linkage operates smoothly

- 5 -

Intake manifold

- secure, not cracked or leaking
- gasket present, not leaking
- lock tabs on lower bolts (2) present

Exhaust manifold

- no leaks (discolored)
- secure, with lock tabs serviceable
- not rusted through
- pipe flange gasket present and serviceable

Master cylinder

- brass seal present
- vent hole in plug not clogged
- fluid level to top of neck
- plug finger tight

Air cleaner

- screen not damaged
- gaskets/joints seal tightly
- oil not gritty or low
- hoses (4) serviceable, clamps secure

Voltage regulator (if truck has one)

- securely mounted
- connections secure
- wires not frayed

Engine

- mounts (2) and bolts secure, not damaged
- engine clean
- no leaks

Emission control device

- no leaks
- fittings and lines serviceable

- 6 -

3. CONTINUE UNDER-HOOD CHECK--PART 2

Starter

- cable secure, not damaged
- mounting bolt secure

Oil filler cap

- present and serviceable
- gasket tight
- chain serviceable

Oil

- dipstick not bent, seats properly
- O-ring seal present, serviceable
- oil level halfway between ADD and FULL
- oil clear, not cloudy

Oil filter

- secure, not leaking

Oil pressure sending unit

- secure
- connections serviceable
- wire serviceable

Windshield washer

- filled, secure, not leaking
- hoses secure, not damaged or leaking

Fuel pump (mechanical)

- mounted securely
- no leaks
- no breaks in case
- no missing parts

Fuel lines

- no leaks
- connections secure
- lines not crushed or rubbing

Distributor

- no cracks (hard to see)
- cables secure
- insulation not damaged
- all screws present and secure

Water temp sending unit

- connections secure, not damaged
- wire not frayed

Horn

- secure
- wires secure, not bare

Lights

- connections secure, not damaged
- no bare wires

CLOSE HOOD

4a. CHECK DRIVER'S SIDE OF TRUCK

Front left tire

- valve cap present
- inflated properly, not leaking (20 lbs. for pavement driving)
- bead snug on rim
- tire not worn or cut to fabric
- at least 1/8" tread in center

Wheel

- rim not damaged
- lug nuts tight
- studs not damaged
- stud holes not enlarged
- air drop eye not damaged
- jam nut secure

Outside mirror

- glass clear, not broken

- arm adjustable and secure
- metal not cracked

Axe (if present)

- mounted securely
- head not rusty
- handle secure, painted

Side panel

- not damaged or rusty
- tie-downs and bow-rod hold-downs not damaged
- reflector clearance light secure, not damaged

Left rear tire

- valve cap present
- inflated properly, not leaking (25 lbs. for pavement driving)
- bead snug on rim
- tire not worn or cut to fabric at least 1/8" tread in center

Wheel

- rim not damaged
- lug nuts tight
- studs not damaged
- stud holes not enlarged
- air drop eye not damaged
- jam nut secure

4b. CHECK REAR OF TRUCKEnd panel

- not damaged or rusty
- tie-down brackets present, not bent
- reflectors secure, not painted or damaged (or lighting kit)

Coupling receptacle

- cover and gasket serviceable

- spring serviceable
- socket not damaged or clogged

Tail lights

- mounted securely
- glass not cracked
- no moisture in light

Shackles

- present, not damaged or rusty
- pin/chain serviceable (A1)

Towing Pintle

- lubed and serviceable, not stuck or rusty
- pin and chain serviceable
- mounting bolts secure

Spare tire

- mount secure
- wheel secure on mount
- valve cap present
- properly inflated
- rim not bent
- tire not worn or cut to fabric
- at least 1/8" tread in center

Fuel can

- not leaking or rusty
- cap and gasket serviceable
- chain serviceable
- retaining strap serviceable
- filler faces away from exhaust

Bumperettes

- mounted securely, not damaged
- numbers correct, clearly readable

5a. CHECK RIGHT SIDE OF TRUCK

Right rear tire

- valve cap present
- inflated properly, not leaking (25 lbs. for pavement driving)
- bead snug on rim
- tire not worn or cut to fabric
- at least 1/8" tread in center

Wheel

- rim not damaged
- lug nuts tight
- studs not damaged
- stud holes not enlarged
- air drop eye not damaged
- jam nut secure

5b. CHECK CANVAS AND PLASTIC WINDOWS

Windows/canvas

- no torn or missing parts
- no cut or frayed straps
- ties secure
- windows clean and clear enough to see through
- doors/side curtains secure, with no damaged or missing parts

6. CHECK INTERIOR OF TRUCK

All dials, gages

- glass not broken or painted over
- no missing parts
- markings readable

Inside mirror

- secure and adjustable
- glass not cracked or cloudy

Hand/parking brake

- handle serviceable
- boot present, secure, not damaged
- brake adjusted--pulls no more than 3/4 travel on full

Transmission and transfer

- knobs present
- boots secure, serviceable

Steering wheel

- wheel not damaged, loose, or hard to turn
- column not damaged or rusty

Seats

- hoses secure, not cracked, leaking, or short
- wiper blades serviceable
- no missing parts

Data plates (decals)

- secure, not painted over

Bottom

- drains clear
- not rusty or dirty

Fuel tank

- cap and gasket serviceable
- vent valve not clogged
- no leaks
- strainer not clogged or damaged
- no loose gear endangering lines
- lines, wires, connectors serviceable

Electric fuel pump (if truck has one)

- no cracks or leaks
- connections secure, not damaged

Batteries

- cover not damaged, rusty, or corroded
- clips not bent
- box clean, not corroded
- service date present, not expired
- hold-downs secure but not over-tight
- cables secure, not corroded
- post protectors serviceable
- posts clean, not corroded or broken
- caps present
- vents not clogged
- electrolyte not low
- caps secure

Tool box

- clean, dry, not rusty
- authorized items present, serviceable
- no unauthorized items

MAKE SURE RADIOS ARE OFF

7. START ENGINE AND CONDUCT OPERATING CHECK

Ignition

- truck starts properly
- switch handle secure
- mount secure

Starter pedal

- secure
- operates smoothly

Choke/throttle

- operates smoothly and holds setting

Turn and warning lights

- all bulbs and lamps--front and rear--work
- all controls work, not damaged

Blackout and headlights

- all lights work
- lights do not flicker when jolted
- dimmer switch operates hi/lo beams

Wipers

- work properly, not noisy

Battery/generator indicator

- needle operates
- needle in green when above idle speed

Engine temp gage

- operates
- engine warms up to 160 to 180, operates about 200 usually

Oil pressure gage

- 15 to 30 PSI on idle, 40 PSI on road
- does not slip, grab, stick, or chatter
- adjusted properly--free play between 1-1/8" and 1-1/2"

Accelerator

- pedal secure
- operates smoothly

Transmission

- operates smoothly, does not stick or jump out of gear

Transfer

- operates smoothly in and out of front wheel drive

Service brakes

- do not grab or slip

Hand brake

- does not slip or grab
- holds on slope

Steering

- operates without excess effort
- no shimmy

Speedometer/odometer

- does not stick, operates properly

Horn

- button serviceable
- horn sounds properly, not low or intermittent

Heater

- securely mounted, not damaged
- operates properly

8. CHECK UNDER TRUCK

Radiator

- mounting bolts/bushings secure
- drain cock works, not damaged
- lower tank not damaged or leaking
- flange guard not bent, all bolts/washers present and secure

A-frame

- bolts (6) and shims secure

Steering

- pitman or idler arms not loose
- tie rod or spindle arm assembly not loose or bent
- grease fittings present, lubed, not damaged
- bushings do not rattle
- cotter pins/nuts present

Front U-joints (wheel drives and shaft)

- do not rattle
- no loose or missing parts
- lubed

Differential

- breather present, not plugged
- lubricant not dripping
- lube level proper (touch with finger)

Shock absorbers

- not leaking, bent, loose or broken
- mounting plate and bolts secure, not damaged

Front springs

- not lopsided
- not broken

Engine oil pan

- gasket not leaking
- drain plug not loose
- pan not badly dented
- screws present and secure

Engine mounts

- secure, all bolts present and tight, not bent or damaged

Flywheel/clutch cover

- no dripping lubricant
- drain plug (for fording) secure in blind boss
- fill/level plug secure
- drain plugs (2) not leaking (reverse shift pivot pin is not a plug)
- breather not clogged

Transmission/transfer

- connector secure, not broken
- fittings not crushed or broken

Battery box drains

- hoses serviceable

Parking brake

- no bent or loose parts
- no oil on brake band
- return spring is engaged and tight (clean band and check wear)

Exhaust system

- no missing, damaged, or loose parts
- manifold secure, not leaking or damaged
- muffler secure, not leaking or damaged
- muffler clamps secure
- heat shield serviceable
- tail pipe secure, not leaking or damaged
- tail pipe clamps secure
- extension present, not damaged

Rear differential

- breather not clogged
- no leaks in case
- suspension bolts secure
- flang. guard washers/screws present (except older models)
- not out of alignment

Rear suspension

- arms or braces not bent
- pins secure
- base plates not bent
- (on A2) pin in mounting bolt not rubbing prop shaft

Shafts and U-joints

- do not rattle
- lubed
- (on A2) spline ends ("short ends") toward differential

Rear shocks

- not leaking, bent, loose, or broken

- mounting plate and bolts secure, not damaged differential

Rear springs

- not lopsided
- not broken

Service brake lines

- no leaks
- no chafed or crushed lines
- tees and connectors dry, no seepage
- clips present and secure

Frame and panels

- not rusted, punctured, or badly bent
- welds not broken

9. CHECK TRUCK RADIO (46 or 160)

Receiver-transmitter

- all cable connectors snug and properly aligned

Power-amplifier (if present)

- switches work smoothly, but not loose
- switch screws present and snug
- power cable clamped to mount securely

Power cable

- not cut, kinked, or torn
- insulation not broken
- connectors locked to receptacles at both ends

Mount

- secure
- connector not broken
- connector cap present

Antenna

- connectors clean, with good contact and without binding or bent pins
- coax and control cables clean, not damaged
- base secure, not cracked
- ground wire (if needed) present and secure
- elements clean, snug, not cracked
- coil spring snug, not weak
- tip and tie down present and secure
- cord not frayed

CHECK PORTABLE FM RADIOS

- Antennas
 - not corroded or bent
 - ferrule secure
 - tip present
 - no gap between antenna and mount
- Antenna and control cables
 - not cut or frayed
 - insulation not broken
 - cable connectors snug in receptacles

Receiver-transmitter

- clean, not greasy, rusty, or moldy
- no dents
- battery connectors not cracked
- connector gaskets not cracked

Controls

- dial lamp works
- channel dial window clean and clear
- power connector cap present and secure
- panel secure, not binding, not rusty
- cap cords present and not frayed

10. CHECK THE TRAILER

Trailer

- hitch
- landing stand
- A-frame

Trailer (Cont.)

- hand brake
- IVC cable and connector
- top
- body/fenders
- lights
- bumper markings
- tires and wheels
- wheel bearings
- spring lube fittings

CHECK LOG BOOK

2408-14

- each problem listed on the -14 should also appear on the 2404
- if so, draw a line through the item on the 2404
- if not, report the discrepancy (may have been corrected but not entered on the -14)

COMPLETE MAINTENANCE

- all problems that can be taken care of without a mechanic (like adding oil) have been fixed
- items that have been fixed are lined out on the 2404

TURN IN FORM 2404

APPENDIX B

LIST OF FAULTS FOUND ON EACH VEHICLE BY EACH SOLDIER

The faults found by soldiers listed in following appendix were extracted from the DA 2404s filled-out by the soldiers during the experiment discussed in the main body of the report.

VEHICLE 1

<u>FAULT</u>	<u>SOLDIER</u>									
	1	2	3	4	5	11	12	13	14	15
1. bumper markings not clear						x	x	x	x	x
2. front bumper bent	x			x	x	x	x		x	
3. R/F lift shackle pin missing					x			x	x	
4. L/F lift shackle missing	x	x	x		x	x		x		
5. lift shackles stuck					x		x			
6. front grille bent						x		x		x
7. R/F fender bent				x		x	x	x	x	x
8. R/F turn signal not aligned					x				x	
9. hood hold down catch damaged					x		x			
10. hood cushion bumpers missing						x				
11. markings missing on hood						x			x	
12. hood rusty							x		x	
13. cowl vent damaged						x		x	x	
14. safety stencils unreadable on hood							x			
15. fan belts cracked/frayed	x						x		x	x
16. water leak at propeller shaft	x									
17. left side of radiator loose							x			
18. radiator cap unservicable	x				x	x	x			
19. generator wire hold-down loose					x			x		
20. oil filler cap unservicable							x		x	x
21. air cleaner oil dirty	x					x	x			
22. air cleaner oil low			x			x	x			
23. R/F tire low					x					
24. R/F tire valve cap missing						x	x	x	x	x
25. L/F tire valve cap missing						x	x	x	x	x
26. L/R tire valve cap missing						x	x	x	x	x
27. spare tire valve cap missing						x	x	x	x	x
28. L/R tire rim bent									x	
29. outside mirror loose							x			
30. right side panel rusty									x	
31. towing pintle stuck						x				
32. fuel can rusty							x	x		
33. fuel can gasket missing										
34. fuel can leaking										
35. trailer coupling receptacle unservicable					x				x	
36. handbrake boot damaged					x		x			
37. seat cushions torn									x	
38. seat cushions dirty									x	
39. passenger seat pin missing	x	x	x		x		x		x	
40. fire extinguisher missing					x	x	x		x	
41. battery box cover rusty									x	
42. battery dirty	x					x	x			
43. battery electrolyte low	x	x			x					
44. battery box dirty	x	x					x	x	x	
45. tool box dirty							x			
46. throttle handle inoperative					x					x
47. heater improperly mounted										
48. oil on parking broke band							x			
49. engine oil drain plug leaking					x					
50. clutch cover leaking						x				
51. fuel gage sticks									x	

VEHICLE 2

<u>FAULT</u>	<u>SOLDIER</u>									
	6	7	8	9	10	16	17	18	19	20
1. bumper markings not clear							x	x		
2. front bumper bent		x					x	x	x	
3. pins missing on lift shackles							x	x		
4. front grille bent						x				
5. R/F blackout marker contains moisture				x	x	x	x			
6. L/F fender damaged/rusty					x	x	x			
7. R/F fender rusty								x		
8. windshield frame rusty										
9. hood cushion bumpers missing						x	x		x	
10. left windshield hinge damaged							x			
11. grille bumpers missing								x		
12. hood safety catch broken								x		
13. fan belts loose										x
14. heater hose clamp loose										x
15. alternator mounting bolts loose										
16. warning cover screw missing								x		
17. carburetor leaking										x
18. intake manifold lock tabs not secure										x
19. master cylinder brass seal missing									x	
20. master cylinder vent hole clogged										x
21. master cylinder plug not secure						x				
22. air cleaner not sealed	x						x			
23. air cleaner oil dirty							x			
24. engine dirty									x	
25. engine oil low							x			
26. L/F tire worn	x						x	x		
27. R/R tire valve cap missing				x			x	x	x	
28. R/F tire valve cap missing				x			x	x	x	
29. R/F tire rim bent									x	
30. outside mirror loose	x			x	x	x	x	x	x	x
31. left side panel rusty										x
32. end panel reflectors unservicable										x
33. L/R light wires bare										x
34. towing pintle stuck								x		
35. spare tire not secure	x	x		x	x			x		
36. fuel can rusty								x		
37. right side panel tir-down missing			x							
38. right side panel bent	x			x				x		
39. canvas unservicable					x	x				
40. hole in rear window	x	x		x	x				x	x
41. windshield hold-down strap missing								x		
42. windshield wiper inoperative	x		x	x		x	x	x	x	
43. data plates missing										
44. interior drains clogged								x		
45. handbrake boot damaged									x	
46. transfer boot damaged					x			x	x	
47. passenger seat cushion torn					x			x		
48. passenger seat pin missing	x	x		x	x			x		
49. seat cushions dirty							x		x	
50. fire extinguisher missing					x	x		x	x	
51. fuel cap gasket missing							x			

FAULT

<u>SOLDIER</u>									
6	7	8	9	10	16	17	18	19	20

52. fuel tank leaking									
53. batter box cover rusty									
54. battery dirty	x		x			x			
55. battery service date expired								x	
56. battery electrolyte low						x		x	
57. tool box dirty							x		
58. temperature gage inoperative	x	x							
59. heater improperly mounted	x			x			x		
60. U-joints not lubricated						x		x	
61. front shock absorber hose	x					x		x	
62. tail pipe clamp missing		x				x		x	
63. oil pan leaking			x				x		

DISTRIBUTION

ARI Distribution List

4 OASD (M&RA)
 2 HQDA (DAMI-CSZ)
 1 HQDA (DAPE PBRI)
 1 HQDA (DAMA AR)
 1 HQDA (DAPE-HRE-PO)
 1 HQDA (SGRD-ID)
 1 HQDA (DAMI-DOT-C)
 1 HQDA (DAPC-PMZ-A)
 1 HQDA (DACH-PPZ-A)
 1 HQDA (DAPE-HRE)
 1 HQDA (DAPE-MPO-C)
 1 HQDA (DAPE-DWI)
 1 HQDA (DAPE-HRL)
 1 HQDA (DAPE-CPS)
 1 HQDA (DAFD-MFA)
 1 HQDA (DARD-ARS-P)
 1 HQDA (DAPC-PAS-A)
 1 HQDA (DUSA OR)
 1 HQDA (DAMO ROR)
 1 HQDA (DASG)
 1 HQDA (DA10-PI)
 1 Cltrf, Consult Div (DA-OTSG), Adelphi, MD
 1 Mr Asst. Hum Res, ODDR&E, DAD (E&LS)
 1 HQ USARAL, APO Seattle, ATTN: ARAGP R
 1 HQ First Army, ATTN: AFKA-OI TI
 2 HQ Fifth Army, Ft Sam Houston
 1 Dir. Army Stf Studies Ofc, ATTN: OAVCSA (DSP)
 1 Dir. Chief of Stf. Studies Ofc
 1 DCSPE-R, ATTN: CPS/OCP
 1 The Army Lib, Pentagon, ATTN: RSB Chief
 1 The Army Lib, Pentagon, ATTN: ANRAL
 1 Ofc, Ass't Sect of the Army (R&D)
 1 Tech Support Ofc, OJCS
 1 USASA, Arlington, ATTN: IARD-T
 1 USA Rsch Ofc, Durham, ATTN: Life Sciences Dir
 2 USARIEM, Natick, ATTN: SGRD-UE CA
 1 USATFC, Ft Clayton, ATTN: SIT 1C MO A
 1 USAIMA, Ft Bragg, ATTN: A1SU CTD-OM
 1 USAIMA, Ft Bragg, ATTN: Marquat Lib
 1 US WAC Ctr & Sch, Ft McClellan, ATTN: Lib
 1 US WAC Ctr & Sch, Ft McClellan, ATTN: Tnq Dir
 1 USA Quartermaster Sch, Ft Lee, ATTN: ATSM-TE
 1 Intelligence Materiel Dev Ofc, EWL, Ft Holabird
 1 USA SE Signal Sch, Ft Gordon, ATTN: ATSO-EA
 1 USA Chaplain Ctr & Sch, Ft Hamilton, ATTN: ATSC-TE-RD
 1 USATSC, Ft Eustis, ATTN: Educ Advisor
 1 USA War College, Carlisle Barracks, ATTN: Lib
 2 WRAIR, Neuropsychiatry Div
 1 DLI, SDA, Monterey
 1 USA Concept Anal Agcy, Bethesda, ATTN: MOCA-MR
 1 USA Concept Anal Agcy, Bethesda, ATTN: MOCA-JF
 1 USA Arctic Test Ctr, APO Seattle, ATTN: STEAC-PL-MI
 1 USA Arctic Test Ctr, APO Seattle, ATTN: AMSTE-PL-TS
 1 USA Armament Cmd, Redstone Arsenal, ATTN: ATSK-TEM
 1 USA Armament Cmd, Rock Island, ATTN: AMSAR-TDC
 1 FAA-NAFEC, Atlantic City, ATTN: Library
 1 FAA NAFEC, Atlantic City, ATTN: Human Engr Br
 1 FAA Aeronautical Ctr, Oklahoma City, ATTN: AAC-44D
 2 USA Fld Arty Sch, Ft Sill, ATTN: Library
 1 USA Armor Sch, Ft Knox, ATTN: Library
 1 USA Armor Sch, Ft Knox, ATTN: ATSB-DI-F
 1 USA Armor Sch, Ft Knox, ATTN: ATSB-DT TP
 1 USA Armor Sch, Ft Knox, ATTN: ATSB-CD-AD

2 HQUSACDEC, Ft Ord, ATTN: Library
 1 HQUSACDEC, Ft Ord, ATTN: ATEC-EX-E -Hum Factors
 2 USAEAC, Ft Benjamin Harrison, ATTN: Library
 1 USAPACDC, Ft Benjamin Harrison, ATTN: ATCP-HR
 1 USA Comm-Elect Sch, Ft Monmouth, ATTN: ATSN-EA
 1 USAEC, Ft Monmouth, ATTN: AMSEL-CT-HDP
 1 USAEC, Ft Monmouth, ATTN: AMSEL-PA-P
 1 USAEC, Ft Monmouth, ATTN: AMSEL-SI-CB
 1 USAEC, Ft Monmouth, ATTN: C, Facil Dev Br
 1 USA Materials Sys Anal Agcy, Aberdeen, ATTN: AMXSY-P
 1 Edgewood Arsenal, Aberdeen, ATTN: SAREA BL-H
 1 USA Ord Ctr & Sch, Aberdeen, ATTN: ATSL-TEM-C
 2 USA Hum Engg Lab, Aberdeen, ATTN: Library/Dir
 1 USA Combat Arms Tng Bd, Ft Benning, ATTN: Ad Supervisor
 1 USA Infantry Hum Rsch Unit, Ft Benning, ATTN: Chief
 1 USA Infantry Bd, Ft Benning, ATTN: STEBC-TE-T
 1 USASMA, Ft Bliss, ATTN: ATSS-LRC
 1 USA Air Def Sch, Ft Bliss, ATTN: ATSA CTD ME
 1 USA Air Def Sch, Ft Bliss, ATTN: Tech Lib
 1 USA Air Def Bd, Ft Bliss, ATTN: FILES
 1 USA Air Def Bd, Ft Bliss, ATTN: STEBD-PO
 1 USA Cmd & General Stf College, Ft Leavenworth, ATTN: Lib
 1 USA Cmd & General Stf College, Ft Leavenworth, ATTN: ATSW-SE-1
 1 USA Cmd & General Stf College, Ft Leavenworth, ATTN: Ed Advisor
 1 USA Combined Arms Cmbt Dev Art, Ft Leavenworth, ATTN: DepCdr
 1 USA Combined Arms Cmbt Dev Art, Ft Leavenworth, ATTN: CCS
 1 USA Combined Arms Cmbt Dev Art, Ft Leavenworth, ATTN: ATCASA
 1 USA Combined Arms Cmbt Dev Art, Ft Leavenworth, ATTN: ATCACO-E
 1 USA Combined Arms Cmbt Dev Art, Ft Leavenworth, ATTN: ATCACO-E
 1 USA Combined Arms Cmbt Dev Art, Ft Leavenworth, ATTN: ATCACO-E
 1 USA Combined Arms Cmbt Dev Art, Ft Leavenworth, ATTN: ATCACO-E
 1 USA Combined Arms Cmbt Dev Art, Ft Leavenworth, ATTN: ATCACO-E
 3 USA Computer Sys Cmd, Ft Belvoir, ATTN: Tech Library
 1 USAMERDC, Ft Belvoir, ATTN: STSFB-DQ
 1 USA Eng Sch, Ft Belvoir, ATTN: Library
 1 USA Topographic Lab, Ft Belvoir, ATTN: ETL TD-S
 1 USA Topographic Lab, Ft Belvoir, ATTN: STINFO Center
 1 USA Topographic Lab, Ft Belvoir, ATTN: ETL GSL
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: CTD MS
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATS-CTD-MS
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATSI-TE
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATSI-TEX GS
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATSI-CTS-OR
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATSI-CTD DT
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATSI-CTD-CS
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: DAS/SRD
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATSI-TEM
 1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: Library
 1 CDR, HQ Ft Huachuca, ATTN: Tech Ref Div
 2 CDR, USA Electronic Prvg Grd, ATTN: STEPP MT-S
 1 HQ, TCATA, ATTN: Tech Library
 1 HQ, TCATA, ATTN: AT CAT-OP-O, Ft Hood
 1 USA Recruiting Cmd, Ft Sheridan, ATTN: USARCPM-P
 1 Senior Army Adv., USAFAGOD/TAC, Elgin AF Aux Flt No. 9
 1 HQ, USARPAC, DCSPER, APO SF 96558, ATTN: GPPE SE
 1 Stimson Lib, Academy of Health Sciences, Ft Sam Houston
 1 Marine Corps Inst., ATTN: Dean-MCI
 1 HQ, USMC, Commandant, ATTN: Code MTMT
 1 HQ, USMC, Commandant, ATTN: Code MPI-20-28
 2 USCG Academy, New London, ATTN: Admission
 2 USCG Academy, New London, ATTN: Library
 1 USCG Training Ctr, NY, ATTN: CO
 1 USCG Training Ctr, NY, ATTN: Educ Svc Ofc
 1 USCG, Psychol Res Br, DC, ATTN: GP 1/62
 1 HQ Mid-Range Br, MC Det, Quantico, ATTN: P&S Div

1 US Marine Corps Liaison Ofc, AMC, Alexandria, ATTN: AMCGS-F
 1 USATRADOC, Ft Monroe, ATTN: ATRO-ED
 6 USATRADOC, Ft Monroe, ATTN: ATPR-AD
 1 USATRADOC, Ft Monroe, ATTN: ATTS-EA
 1 USA Forces Cmd, Ft McPherson, ATTN: Library
 2 USA Aviation Test Bd, Ft Rucker, ATTN: STEBG-PO
 1 USA Agcy for Aviation Safety, Ft Rucker, ATTN: Library
 1 USA Agcy for Aviation Safety, Ft Rucker, ATTN: Educ Advisor
 1 USA Aviation Sch, Ft Rucker, ATTN: PO Drawer O
 1 HQUSA Aviation Sys Cmd, St Louis, ATTN: AMSAV-ZDR
 2 USA Aviation Sys Test Act., Edwards AFB, ATTN: SAVTE-T
 1 USA Air Def Sch, Ft Bliss, ATTN: ATSA TEM
 1 USA Air Mobility Rsch & Dev Lab, Moffett Fld, ATTN: SAVDL -AS
 1 USA Aviation Sch, Res Tng Mgt, Ft Rucker, ATTN: ATST-T-RTM
 1 USA Aviation Sch, CO, Ft Rucker, ATTN: ATST-D-A
 1 HQ, DARCOM, Alexandria, ATTN: AMXCD-TL
 1 HQ, DARCOM, Alexandria, ATTN: CDR
 1 US Military Academy, West Point, ATTN: Serials Unit
 1 US Military Academy, West Point, ATTN: Ofc of Milt Ldrshp
 1 US Military Academy, West Point, ATTN: MAOR
 1 USA Standardization Gp, UK, FPO NY, ATTN: MASE-GC
 1 Ofc of Naval Rsch, Arlington, ATTN: Code 452
 3 Ofc of Naval Rsch, Arlington, ATTN: Code 458
 1 Ofc of Naval Rsch, Arlington, ATTN: Code 450
 1 Ofc of Naval Rsch, Arlington, ATTN: Code 441
 1 Naval Aerosp Med Res Lab, Pensacola, ATTN: Acous Sch Div
 1 Naval Aerosp Med Res Lab, Pensacola, ATTN: Code L51
 1 Naval Aerosp Med Res Lab, Pensacola, ATTN: Code L5
 1 Chief of NavPers, ATTN: Pers-OR
 1 NAVAIRSTA, Norfolk, ATTN: Safety Ctr
 1 Nav Oceanographic, DC, ATTN: Code 6251, Charts & Tech
 1 Center of Naval Anal, ATTN: Doc Ctr
 1 NavAirSysCom, ATTN: AIR-5313C
 1 Nav BuMed, ATTN: 713
 1 NavHelicopterSubSqua 2, FPO SF 96601
 1 AFHRL (FT) Williams AFB
 1 AFHRL (TT) Lowry AFB
 1 AFHRL (AS) WPAFB, OH
 2 AFHRL (DOJZ) Brooks AFB
 1 AFHRL (DOJN) Lackland AFB
 1 HQUSA (INYS)D
 1 HQUSA (DPXXA)
 1 AFVTG (RD) Randolph AFB
 3 AMRL (HE) WPAFB, OH
 2 AF Inst of Tech, WPAFB, OH, ATTN: ENE/SL
 1 ATC (XPTD) Randolph AFB
 1 USAF AeroMed Lth, Brooks AFB (SUL-4), ATTN: DOC SEC
 1 AFOSR (NL), Arlington
 1 AF Log Cmd, McClellan AFB, ATTN: ALC/DPCR8
 1 Air Force Academy, CO, ATTN: Dept of Bel Scn
 5 NavPers & Dev Ctr, San Diego
 2 Navy Med Neuropsychiatric Rsch Unit, San Diego
 1 Nav Electronic Lab, San Diego, ATTN: Res Lab
 1 Nav TrngCen, San Diego, ATTN: Code 9000-Lib
 1 NavPostGraSch, Monterey, ATTN: Code 55Aa
 1 NavPostGraSch, Monterey, ATTN: Code 2124
 1 NavTrngEquipCtr, Orlando, ATTN: Tech Lib
 1 US Dept of Labor, DC, ATTN: Manpower Admin
 1 US Dept of Justice, DC, ATTN: Drug Enforce Admin
 1 Nat Bur of Standards, DC, ATTN: Computer Info Section
 1 Nat Clearing House for MH-Info, Rockville
 1 Denver Federal Ctr, Lakewood, ATTN: BLM
 12 Defense Documentation Center
 4 Dir Psych, Army Hq, Russell Ofcs, Canberra
 1 Scientific Advis, Mil Bd, Army Hq, Russell Ofcs, Canberra
 1 Mil and Air Atache, Austrian Embassy
 1 Centre de Recherche Des Facteurs, Humaine de la Defense Nationale, Brussels
 2 Canadian Joint Staff Washington
 1 C/Air Staff, Royal Canadian AF, ATTN: Pers Std Anal Br
 3 Chief, Canadian Def Rsch Staff, ATTN: C/CRDS(W)
 4 British Def Staff, British Embassy, Washington